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such bends of the stream as passed over practicable ground, he succeeded in his attempts. It is obvious, that, where the *are* described by a road going over a hill, is greater than that which is described by a circuit, the circuit is preferable; but it is not known to every overseer, that within certain limits it will be less laborious to go round the hill, though the circuit should be much greater than that which would be made in crossing the hill. Where a hill has an ascent of no more than one foot in thirty, the thirtieth part of the whole weight of the carriage, of the load, and of the horses, must be lifted up, whilst they advance thirty-feet. In doing this, one-thirtieth part of the whole load continually resists the horse's draught; and in drawing a waggon of six tons weight, a resistance equal to the usual force of two horses must be exerted.

The most sudden ascents, in the roads in England, are usually over canal bridges. It has been proposed to make winding roads to these bridges; but for this there is no necessity, as the expense of continuing the present inclined roads, that go over them, to a proper distance, cannot be very considerable.

What is here said, respecting level roads, must not be strained to an assertion, that a perfectly level road is always the best for every species of draught. Slight and short alternations of rising and falling ground are serviceable to horses moving swiftly; the horses have time to rest their lungs, and different muscles: and of this experienced drivers know well how to take advantage.

*On Planting Forest Trees; by H. Ainslie, M.D.
of Dover-street.*

(From the Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce.)

Having determined to plant a large intack of 77 acres 30 perches, part of a barren common long since inclosed and fenced round with a stone-wall six feet high, I selected 16 acres of it which were much exposed, and planted them, in the year 1807, with 22,700 larches, 5,700 oaks, and 2000 Scotch firs. I expected these plants would break the force of the winds, and protect those I might plant at a future period.

The remaining part of this intack I planted in the spring of 1809, with 96,150

larches, 10,300 Scotch firs, 3,400 oaks, 1990 beech, and 1000 Spanish chesnuts. In the winter of the same year, I filled all the vacant spots with 10,000 larches: the plantation therefore contains 151,240 forest trees, of which 28,400 were planted in 1807, 112,840 in the spring of 1809, and 10,000 in the following winter. The certificates I annex, refer to the 112,840 planted in the spring of 1809, but the whole are included in the expression of their flourishing state.

The Society will consider me as merely presenting them with an account of my having planted 112,840 forest trees upon 61 acres in the spring of the year 1809; and I shall be happy if the following observations respecting the whole of my plantations for 22 years, should be thought deserving of their notice. The total of forest trees I have planted, is 378,565.

Since I had the honour of presenting myself to the Society of Arts, &c., as a candidate for one of their honorary rewards to planters of forest trees, I have not been idle in a pursuit which has given me so much pleasure. Unfortunately, however, I am tied down by my profession so closely to the metropolis, that I have only been able to visit my plantations once in two years, and never in one season to dedicate more than a week or ten days to their management. This time, short as it is, has not been thrown away, and as what I have done has answered my expectations, it may meet the wishes of the Society to be made acquainted with it; and I am the more induced to submit some observations to them, because I find in their annual publications, many accounts of putting trees into the ground, but few of their treatment afterwards. Upon subsequent treatment, however, every thing depends, for I agree with an old gentleman who many years ago told me, that any fool could plant, but only a wise man could rear timber. The difficulties I felt in my first attempts, would have been much lessened, had I sooner had the advantage of seeing the excellent papers presented to the Society by Mr. Waisell, published in their 26th volume; they have been invaluable to me, and cannot fail to prove so to all planters.

I cannot express the mortification I felt in passing some large plantations of firs, in my way to and from the North of England last year. For thirty years, I can venture to say, no axe has been near them, and the trees now stand disgraceful poles

forty feet high, and at three and four feet asunder. These trees never will be timber. I saw oaks in the same predicament, as close as they usually stand in nurseries, twenty-five or thirty feet high, and not three inches in diameter. I cannot perceive any merit in such sort of planting. No man will ever plant to profit, who does not go through his plantations early, with an axe in his hand, and a cold calculating heart. Nothing can be more unpleasant, than to cut down a thriving tree; but it must be done, or you will have no timber. I have not hitherto thinned my plantations on any regular principle, nor do I know any mode I could recommend under all circumstances. It is to be recollected, that I speak of plantations of larches and firs planted four feet asunder. I had permitted my earliest plantations to grow without attention to them, for ten or twelve years. I found the trees choaking each other, and set about correcting my error the best way I was able. I cut down about a fourth part of them. For two or three years they increased little in girth, but shot up near two feet annually. I cut down a fourth of the remainder. In two years more they were much improved, but many of them had a rigidity in the bark, which is an infallible sign of their being too close. I again thinned them more moderately, and in two years the bark was burst in almost every tree. One tree, which I measured at six feet, was actually increased in circumference five inches. This plantation was in the centre of a copse, and particularly well sheltered. All my other plantations are more exposed, and not being so much drawn up, were taken in time, and have cost me little trouble. The plan I now pursue, is to begin thinning in eight years. I mark the rows of inferior trees, which are always to be found, and cut them all down. I cross in every direction, as the smaller trees prevent themselves, and wherever I find a weak plant, it falls. The first thinning takes away about one in four. In two years more, I attack them again. I cut down every row of second-rate trees, and when I come to a parcel of equal size, I cut down one in three. Proceeding in this manner, cutting down one tree in four at each thinning, I find I give sufficient air, but never too much; regularity I utterly neglect, because, after three or four thinnings, the trees are certain to be at proper distances. I will now mention the effect of this treatment. My larches

of twenty years growth average from twenty-two to twenty-four inches in circumference at six feet. The Scotch firs in favourable situations do the same; in very exposed ones, the average is from seventeen to twenty. The height of the former is from thirty-six to forty feet, of the latter, from thirty to thirty-six feet. I purpose to thin these plantations again in 1812, and 1815, at which latter period they will be twenty-six years old, and every tree will contain six feet of square timber, and many of them upwards of ten. There will then be about seven hundred on each acre, the subsequent treatment of which will depend upon circumstances I cannot at present foresee. My larches of fourteen years growth, which were thinned in good time, average from fifteen to eighteen inches in circumference at six feet, so that I have not the least doubt of their far exceeding my first plantations.* I said, that the tall firs I saw in the North road *never* would be timber, and I think I can prove it from what has occurred to myself. I have two hundred Scotch firs, which are about sixty years old; when they were thirty-five years old, they had never been thinned, and were nearly fifty feet high, with very little head. These trees have been carefully thinned at intervals; they now, at sixty years, average fifteen feet of timber only. What they would have contained, had they been treated properly, may be known, from viewing about a score of them planted in a hedge-row adjoining, each of which contains between forty and fifty feet of timber. Had I cut down these firs twenty-six years ago, I should have had four times the number of larches, nearly the same size, upon the ground they at present cover. I formerly mentioned, that the utmost value of the land I had planted, was 1s. or 1s. 6d. an acre, per annum. As I have generally selected inclosures already well fenced, the expense of

* In the Bishop of Llandaff's report of his first larch plantations, then twenty or twenty-one years old, I find that the circumference at six feet was on an average eleven inches. They are on *very high and exposed* ground. Mr. Curwen mentions his having used larches sixteen years old for his rail-roads, and says they squared four and a half or five inches each. A tree which squares five inches, must be twenty-one inches in circumference.

fencing has been inconsiderable. I have, within the last twenty-one years, planted 378,563 forest trees; about 25 or 30,000 larches surround my copse woods, the rest are in clumps of unequal dimensions, from seventy-seven acres to half an acre. The whole expense of plants, planting, fencing, and preserving, with compound interest, does not exceed £1000. It is no idle speculation, to look forward to what may be the value of 50,000 larches, of forty years growth, nor to what the thinnings of the plantations may produce in the interim; and I trust it will be found, that I have converted bad land to a good purpose, at as little expense as any planter in the kingdom.

As I have not confined myself to planting larches and firs only, but have also planted many thousands of oak, ash, beech, and other trees, I would add a few words upon my management of oaks. My plan has been to mix them with larches and firs, and to cut them down to the ground in about three years, and I find, in a few years more, that they spring up in abundance, and show themselves on the first thinning of the larches. In two or three years I give the larches a much more severe thinning, so as to leave the oaks plenty of room, and I find that they shoot up rapidly. The land is much too high and exposed, to permit oaks to grow without the protection of larches; but the soil is so much improved by the dead leaves, grass, and fern, that I have not the least doubt of rearing very fine oaks on this poor land. In compliance with the request of Mr. Waistell, I have measured a great number of larches of different ages, and shall continue to do so for some years to come. My intention is not to take trees promiscuously, but those I should call the second best in each plantation, as there are always twice the number of that kind, that can possibly be left to stand for timber, and all the inferior trees will of course be cut down first. I shall not fail to inform the Society if any thing occurs in the course of my experiments, worthy to be communicated, or likely to be of service.

Method of fixing Chalk Drawings; by Mr. R. D. Gathery, Mad-row, near the Aylum.

(From the Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce)

Having tried several experiments for

the purpose of ascertaining the best and most effectual method of fixing black and white chalk drawings, I have selected a few specimens from among them, for the inspection of the gentlemen of the Society of Arts, &c.; and have fully explained each method in the annexed paper according to the number of each specimen, hoping at the same time they will excuse the rough manner in which they are done, as it was not in my power to make drawings; they will, however, shew that the chalk is fixed without staining the paper, or in any way injuring the drawing.

Specimen, No. 1,

Will bear rubbing with India-rubber with very little alteration, unless it is rubbed so hard as to injure the paper; drawings in crayons may be fixed in the same way.

Specimen, No. 2,

Will bear rubbing with India-rubber without any alteration; each method is very simple, and not expensive.

Specimen, No. 3,

Is performed by the artist making his drawing on soft paper that has not been sized, such as blotting-paper: and when it is finished washing the back of it over with a wash, and when quite dry, no rubbing can injure it, and it will harden the paper and not stain it in the least. Drawings in different coloured crayons may be fixed by the same method. This wash will be an excellent thing to wash prints with that are printed on soft paper, as it not only hardens the paper, but prevents them from being so easily stained and damaged, which soft paper is so liable to do by handling, as it is of so spongy a nature that it soaks up directly the least wet or grease it touches, and this wash is a great preserver of the paper. Aquatint prints that are printed in colours are always printed on hard paper, because soft paper will not do to tint with water colours, on account of the colour sinking quite through directly as it touches the paper, which the wash totally prevents. You may colour on soft paper that is washed over as well as you can on hard; better impressions can be taken on soft paper, and when washed over and pressed they cannot be distinguished from hard paper; so that printers may entirely give up the use of hard paper, as it is not fit for such delicate plates as aquatint, or mezzotint, &c. Old prints on soft paper